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Editorial

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Two under-recognized limitations of number needed to treat

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The number needed to treat (NNT) is often used as a measure of treatment benefit, for example in the effect of statins in preventing a heart attack in people selected as being at risk. It is intended to indicate the number of people that need to be treated to prevent one case of a specific disorder. The NNT is the reciprocal of the absolute risk reduction between a treated and untreated group. Limitations of the use of NNT have been described[1,2] but two important limitations have not been sufficiently recognized, one because of how the absolute risk reduction is estimated, and the other because of a false assumption relating to the application of NNT to the prevention of chronic disease.

The first limitation, which is often ignored, is that the NNT depends on the time interval over which the medical event of interest is assessed. For example, if over 1 year the rates of events in a treated and in an untreated group were 5/100 and 10/100, respectively, the NNT would be the reciprocal of the absolute risk reduction of 5/100 (10/100–5/100) i.e. 20. If the time interval were extended to 5 years and if the corresponding estimates were 25/100 and 50/100, the NNT would be the reciprocal of 25/100 (50/100–25/100) i.e. 4 instead of 20 with no change in the relative risk reduction, which is 50% in both cases, [1–(5/100 ÷ 10/100)] and [1–(25/100 ÷ 50/100)], respectively. A time frame could be specified, such as the number of clinical events arising in 1 year.[3] However, this estimate will vary as people get older, and for many interventions treatment is long-term and even lifelong, for example using medicines to lower blood pressure or statins to lower serum cholesterol. In such circumstances, what is of interest is the expected lifetime benefit.

The second limitation is that the absolute risk reduction, on which the NNT estimate is based, assumes that the effect of treatment is dichotomized into some individuals benefiting by not having the medical event which treatment is designed to prevent and other individuals having no benefit at all. In practice this complete separation is rarely true. More often all individuals treated have a benefit that arises from the medical event being delayed, unless they die from an unrelated cause of death before they would have had the medical event of interest in the absence of treatment.

The second limitation is illustrated in the Figure 1 which compares the health benefits from a treatment to prevent myocardial infarction (MI) using MI cases avoided (as used to estimate NNT) and the more appropriate method using years of life gained without an MI. For individual 1, there is no benefit from treatment whichever method is used because a non-MI death occurs before the individual would have had an MI without treatment. With individual 2, there is a treatment benefit using years of life gained without an MI (8 years) but no benefit when counting MI cases. With individual 3, there is a benefit using either method but the method using years of life gained without an MI (5 years) quantifies the benefit whereas the other method does not.

The two limitations can be overcome by estimating two measures previously described[4]: (i) the proportion of people who will benefit to some extent from the intervention over their lifetime; and (ii) among these people the average years of life gained without the clinical event that

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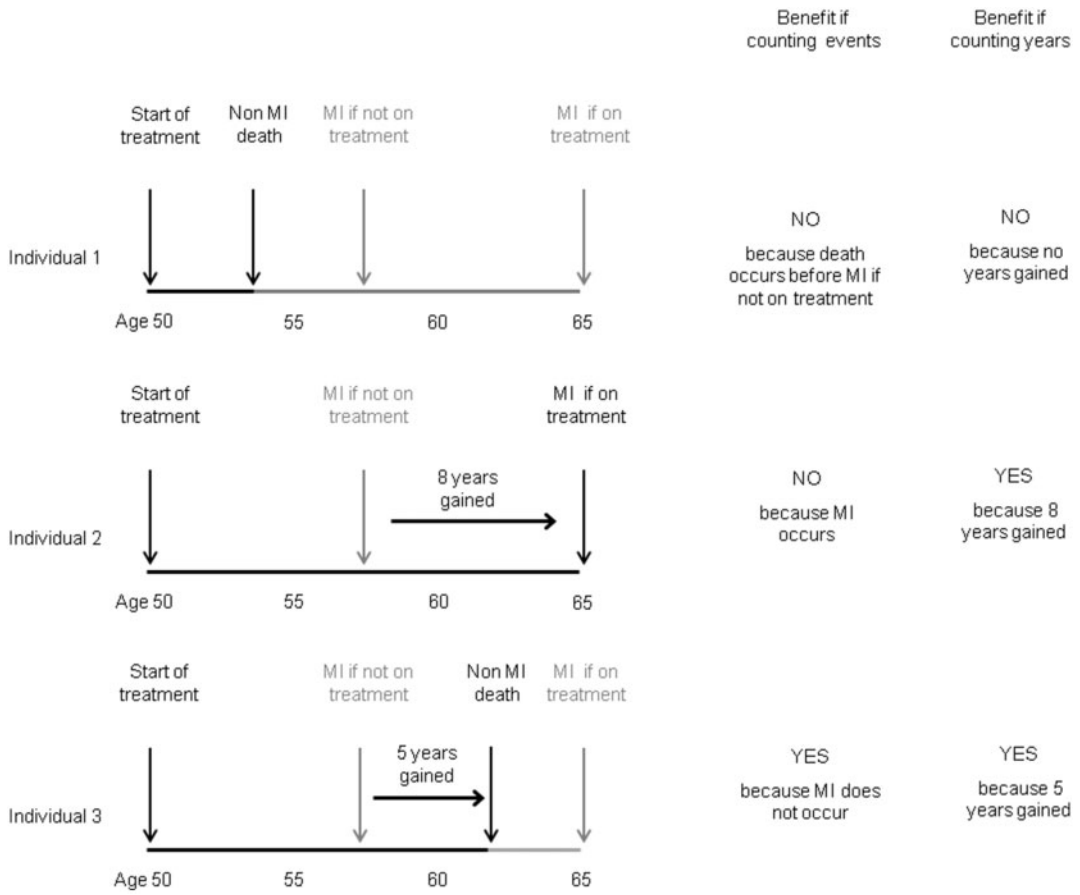

Figure 1. Comparison of two methods of assessing the health benefits of treatment to prevent myocardial infarction in three individuals.

the intervention seeks to prevent. The proportion of people who benefit will be everyone who would have had the clinical event without the intervention and the average years of life gained on treatment without the clinical event can be estimated using standard life table analysis based on age-specific incidence rates in a given population.

The two limitations described here can have a significant impact on judging the value of medical interventions. Failure to recognize these limitations can substantially underestimate the benefit of preventive treatments.

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